SEARLES LAKE BORAX

1862-1962

The Centennial of the
John W. Searles Borax Discovery

By L. BURR BELDEN
and
ARDIS MANLY WALKER

Published for the dedication of the
Searles Lake Monument on November 8, 1962
by the Death Valley '49ers, Inc.

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The Searles Discovery of 1862

By L. Burr Belden

One hundred years ago, in 1862, a prospector leading his burro over the spongy surface of a dry lake in the Mojave Desert picked up some shimmering crystals from the playa.

This man, John Wemple Searles, was hunting for gold and silver in the Panamint Range which he could see ahead. Searles marveled at the salty crystals found in profusion on the lake bed. They were interesting, so interesting that Searles tucked some in his ore sack and pushed on. He was one of hundreds of roving prospectors who had heard tales of fabled riches in the Death Valley region where one explorer had fancifully reported the Indians shot arrows tipped with points of beaten gold, where a starving '49er had improvised a gun sight from a piece of pure silver.

Searles, like his legion of fellow searchers, found plenty of hardship but no great amount of gold in the Death Valley region. He turned to the High Sierra, did considerable locating, but never on the bonanza vein he sought. While in the upper Kern River canyon, in the spring of 1870, he had a near fatal encounter with a grizzly bear. By 1872 Searles had moved over along the California-Nevada border where he saw Francis M. Smith reclaim borax from crystals found on the floor of Teel's Marsh.

The crystals looked familiar to Searles. He remembered having picked up similar ones back on that desert dry lake years before.

Actually John Searles and his older brother, Dennis, had been told once before that the curious crystal samples contained borax, but they had thought little of the fact. While camped in the Slate Range, they had used some of the crystals in ore reduction. An engineer, temporarily camped with them, said there was borax in the substance. Neither brother had seen borax at the time. Like most prospectors of the time, they wanted gold or silver.

Now, after seeing Smith get borax from the dry lake over in Nevada, Searles was satisfied that he had discovered a vast borax deposit unknown to others. Searles backtracked. His find was worth more than the gold which had been eluding him. Borax was retailing for 80 cents a pound and selling for nearly half that at the early mills. True, many early manufacturers were dropping out of the race, but Searles had seen the poor quality of their product and the meager Columbus Lake supply being split between them. His lake was far richer, he knew.

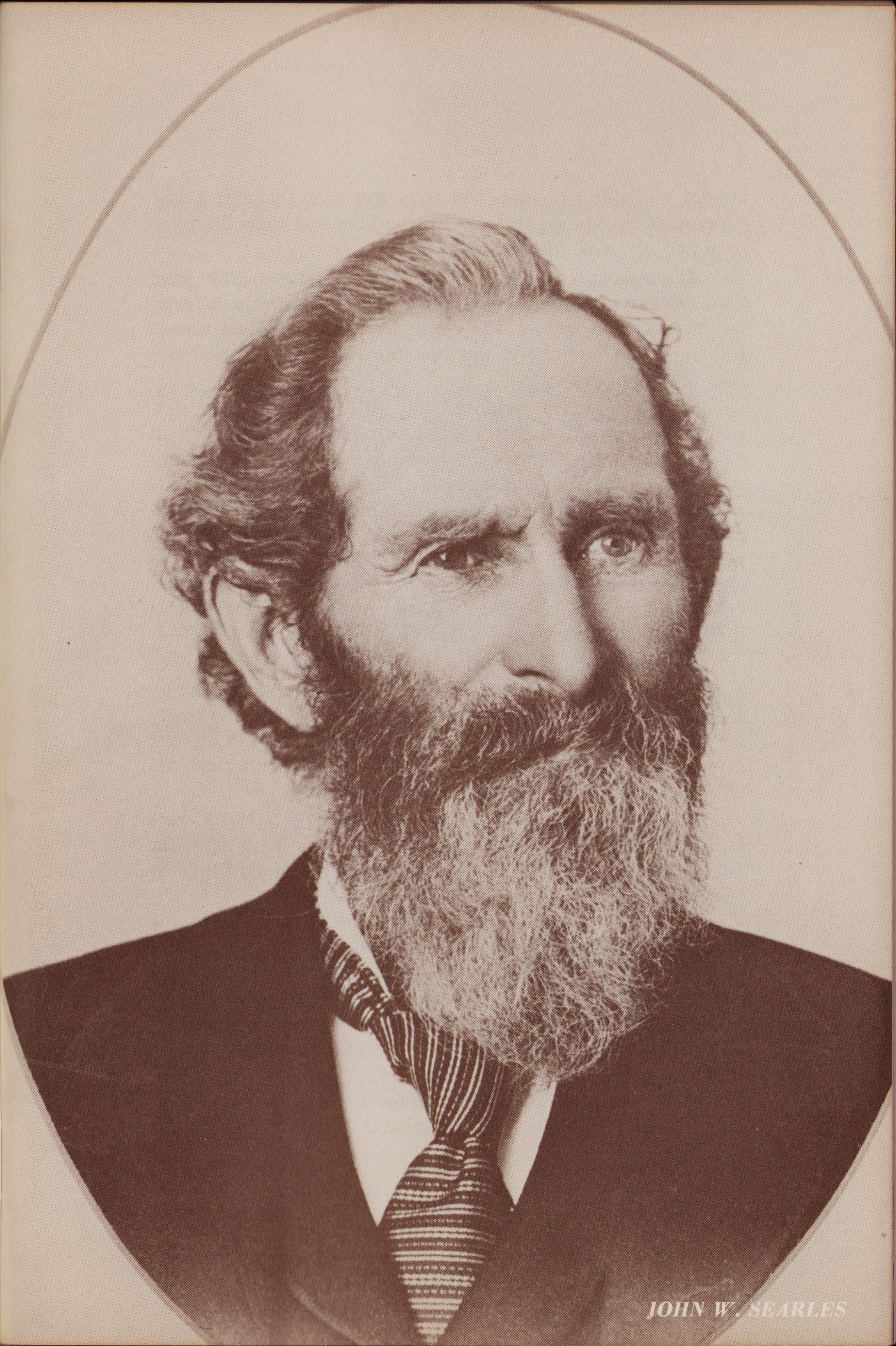
John Searles and his brother, Dennis, organized the San Bernardino Borax Mining Co. in 1873. They filed on the northern end of Searles Lake and built a plant on the northwest shore near where the present city of Trona stands. Searles had no way of knowing he had actually discovered the richest deposit of diversified chemicals in history.

Searles Lake, or Searles Marsh as it was generally known in pioneer days, is said to have produced one million pounds of borax during 1873 which was the first year of operations there. The production was estimated to have been worth $200,000.

Searles' San Bernardino Borax Mining Company's plant had a capacity of 100 tons of refined borax a month. It was operated throughout the year in 1874 and was destined to continue operations on a scale that was large for the period until 1898 when, after John Searles' death, it was picked up by Smith for $200,000 and became a unit of the expanding Pacific Borax Company empire. Smith closed the Searles Lake plant.

With the two Searles brothers, the founders of the San Bernardino Borax Mining Company were Charles Grossard and Edwin Schillings.

If the Searles brothers thought they would have the dry lake to themselves, they were mistaken. Prospectors turned from gold hunting to look for borax by the score. Searles had filed for much of the surface of his lake as a slime deposit. Now he learned that the land or marsh must be taken up as a placer claim limited to 20 acres. Together with his associates,



JOHN W. SEARLES

Searles was able to obtain 160 acres, but even that left a vast expanse of unclaimed surface, for the lake was some 10 miles long and had a width up to four miles.

The discoverer made an alliance with nature which gave him effective possession of the whole lake, despite the acreage limitation on his claims. The closest known pure water was at Indian Valley Wells, over the mountains to the west and more than 20 miles away.

Searles, however, explored the little valleys and depressions back toward the mountains, especially one or two in which there were cottonwood trees. The most likely looking spot was Valley Wells, just north of the lake. Its cottonwoods were found watered by seepage near the surface, and Searles tried a wash to the west. Here, some seven miles from his plant, he developed sweet water. He named it "The Garden" and built his house there. Fresh water needed for the mill was developed at "The Garden." Other prospectors worked with their water supply a day's journey distant.

It took capital to finance a successful borax operation. While Dennis Searles and one of the other founders, said by some accounts to have been Schillings, remained in the vicinity of the dry lake, John Searles went to San Francisco to interest capital in the venture. There he successfully eluded a trap laid to wrest control of the lake from him.

Searles told the story to John N. Spears nearly 20 years later while Spears was obtaining material for a book on borax published by Rand McNally & Co. Spears' account follows in part:

"Searles took certain samples of incrustations from the marsh below his camp and brought them to San Francisco and showed them at the office of the borax company. He was soon invited to go into a private room. There he found several wealthy capitalists very much excited. There was a discussion of the matter, and then an agreement was made orally to form a company on terms agreeable to Searles.

"This done, he was told to go back and get more samples and a greater variety. He did so and brought mud, water, crusts, carbonate of soda and best of all some tincal—the naturally formed borax. . . . His samples very plainly excited the crowd, as before. Searles was invited to come again when the samples had been analyzed. He came and got a frigid reception. He was told there was not a single trace of borax in any one of his samples, and he was advised to prospect for copper.

"Meanwhile Searles had sent several hundred dollars at the behest of these men and was at the bottom of his pocket. He said, as he had worked for them, they should share the expense, but if they would give him the cost of a passage to Los Angeles he would call it square. The capitalists could not afford to put up the $25, they told him. He went out, met a friend, and borrowed the money, then hurried back to his lake."

In retrospect Searles evidently suspected that the San Francisco group was trying to sidetrack him while they sent others to file on the dry lake. The rush of prospectors to Searles Lake followed. Two competing companies were actually to start operations. One, a Los Angeles group, spent $10,000 and sent a "borax expert" from Nevada to handle operations. The claims of this group were rich in sulphate of soda but contained little or no borax. The L.A. backers threatened to lynch their "expert" borax maker.

An Englishman, Arthur Robottom who had written several scientific articles on borax, arrived via San Francisco and contracted to buy 1,280 acres of lake bed. A small borax works was started, and 100 tons of borax was actually made before the San Francisco bankers, headed by a Mr. T. Dodge, gave up. It cost them more to make borax than the market price.

To convert the Searles Lake crystals into marketable borax and to transport the refined product provided the major obstacles to the Searles enterprise. The dry lake was 250 miles from tidewater. There was no railroad closer than what is now Bakersfield which the then-infant Southern Pacific reached in 1874. To get his borax to market, Searles built a mill at the dry lake and set up a mule-drawn freight line all the way to San Pedro.

With a mill and freight line in operation, Searles found that his competitors not only didn't bother him but actually helped. They now realized that borax production at the lake would take capital and organization, things few of them had. They left even more rapidly than they had arrived. Several had collected sizable dumps of crystals which they either abandoned or sold to the Searles group at the latter's price. Part of the reason the San Bernardino Borax Mining Co. was able to make such a big showing during its initial operations was due to the supplies first harvested by competitors.

The best borax deposits were the center of the lake where there was an oval area some 1,700 acres in extent depressed slightly below the level of the playa. In the depressed center oval, water stands as much as a foot deep in wet years. The surface water was found to be of a dark brown color. Below this brown liquid was a layer of mud full of large crystals which were found in nests at irregular intervals to a depth of three or four feet.

The natural crystals were green and translucent, often with fluids in their large cavities.

Searles found that 13 tons of the crystals would make a ton of borax.

Working the borax beds was a simple operation. The crystals were raked into windrows and hauled in carts to the mill two miles distant. The holes made by extracting crystals soon filled with the brown brine. When the lake brine came in contact with the surface soda, it, too, formed borax crystals. Brush was thrown in the holes, and crystals formed on it with even greater rapidity. It was found that ground worked over for borax grew a new crust which was again profitable to work in three or four years. Searles had found a borax deposit which renewed itself by natural forces.

The Searles brothers ranked high among the early industrialists who refused to be turned back by the gigantic obstacles that confronted anyone who sought to successfully market a product obtained from remote and climatically forbidding areas.

Dennis and John Searles were natives of Tribes Hill, a small settlement in Montgomery County, New York. Their grandfather, Dennis Searles, had been a captain in the American Revolution. There, following the War for Independence, the soldier had used his "bonus" or script to obtain land in the Mohawk River Valley. His son, George, had farmed the tract and there raised a family including sons he named Dennis Searles II and John. Dennis II was born in 1826 and John in 1828. In 1849 they left for the California gold fields by ships around Cape Horn.

Arriving in San Francisco the Searles brothers first went prospecting in Shasta County. There, on Indian Creek, they bought two mining claims and 160 acres of land. Dennis farmed while John mined. The venture failed to yield large profits and was sold. The brothers traveled south to Los Angeles seeking some business opportunity. John again went prospecting. First he looked over Havilah, Keysville and Whiskey Flat in the Kern River gold fields. There he lost most of his lower jaw in a desperate fight with a grizzly. He returned to Los Angeles to recuperate and then set out again in company with Dennis, this time for the Panamints—the trip that produced the curious lake crystals.

The San Bernardino Borax Mining Co. was an ingenious operation. Borax crystals were boiled in huge vats. Water was supplied from a tiny oasis in the nearby Argus Range. The oasis, thought by many to have been the Providence Spring that had saved an 1849 caravan known as the Jayhawkers, had been occupied by an Indian known as Joe. Searles took over the waterhole which he called Indian Joe Spring, doubtless as some compensation to its former occupant.

Wagon teams collected brush for the plant's boilers. A multiple team transport was started to distant Mojave. Wagons were hitched in tandem behind 12, 16, 20 and even 22 mules. A small kerosene tank wagon was sandwiched between the heavier ore wagons.

Two roads were used. In winter months when desert sands would pack enough to supply firm footing the Searles wagons would head north from Mojave to the site of today's Cantil. There they would veer northeast up the canyon occupied by Garlock, emerge near Searles Station and then continue to the borax lake along the route now spanned by the Trona Railroad.

In summer this route was too soft. Searles teams followed north past Cantil up Red Rock Canyon to about the mouth of Walker Pass, then turned east to Searles Station. At the station Searles had reliable wells. He grew hay there and built corrals.

Thus the San Bernardino Borax Mining Co. operated until after the death of its two owners. Dennis Searles died in the early 1890s, John in October, 1897. John Searles had a son, Dennis III, who operated the desert plant briefly and then sold out to Francis M. Smith and the Pacific Coast Borax Co. Smith closed down the Searles plant, moving teams and equipment to PCB's scene of operations at Daggett and Borate. Young Searles was given an executive post at PCB's Alameda refinery. The Searles connection with borax ended there when Dennis was killed while the automobile he was driving left the road and was smashed on the rocks at San Francisco's Cliff House.

In World War I days the old Searles lease was reactivated when the Solvay Process Co. used Searles Lake brine to make potash. Some borax was produced which, under terms of the lease, was turned over to PCB. Solvay stopped operations after the war and vacated its town, Borosolvay.

The Baron Doesn't Quit

By L. Burr Belden

The model community of Trona, where 900 of the 2,800 residents are employes of the American Potash & Chemical Corporation, might have been abandoned before it was more than started a half century ago had it not been for the faith and determination of a Baltic nobleman who convinced distant capital that borax and sodas could be profitably extracted from Searles Lake brine.

This man, who mastered problems others had thought hopeless, was Baron Alfred de Ropp, young nobleman from Russia's Baltic states who came to America following graduation from a German technical school. In the United States de Ropp remained to leave an indelible imprint on the West's mining development.

De Ropp became president of what was then known as the California Trona Co. after his predecessors had been unsuccessful in making soda and potash from Searles Lake brine. He was confident that better methods would turn failure into success. He staked his reputation as an engineer on this belief, and he won.

Distant capital, the Consolidated Gold Fields, backed the Trona company. De Ropp had been made manager of Consolidated for its United States investments in 1908. His offices were in San Francisco. Consolidated Gold Fields, a British firm, had an American branch known as Goldfields American Development. This company had a hydroelectric plant on Truckee River, three California gold dredging projects, gold projects in Alaska, oil interests in Mexico and its potash and borax works on Searles Lake.

The British interests invested most of the $300,000 that had been sunk in the unsuccessful soda plant as well as the $1.5 million that was lost in the potash plant. The knowledge that they owned America's largest potash deposit was little more than a mockery to the London capitalists at the time when Baron de Ropp called in Charles P. Grimwood to make his now-famous tests. Grimwood had an entire tank car of Searles Lake brine shipped to his laboratories in New York. Grimwood and his assistants spent several months testing the brine and then came to California with an outline of a process by which potash and other chemicals could be recovered at a unit cost low enough to make it practical.

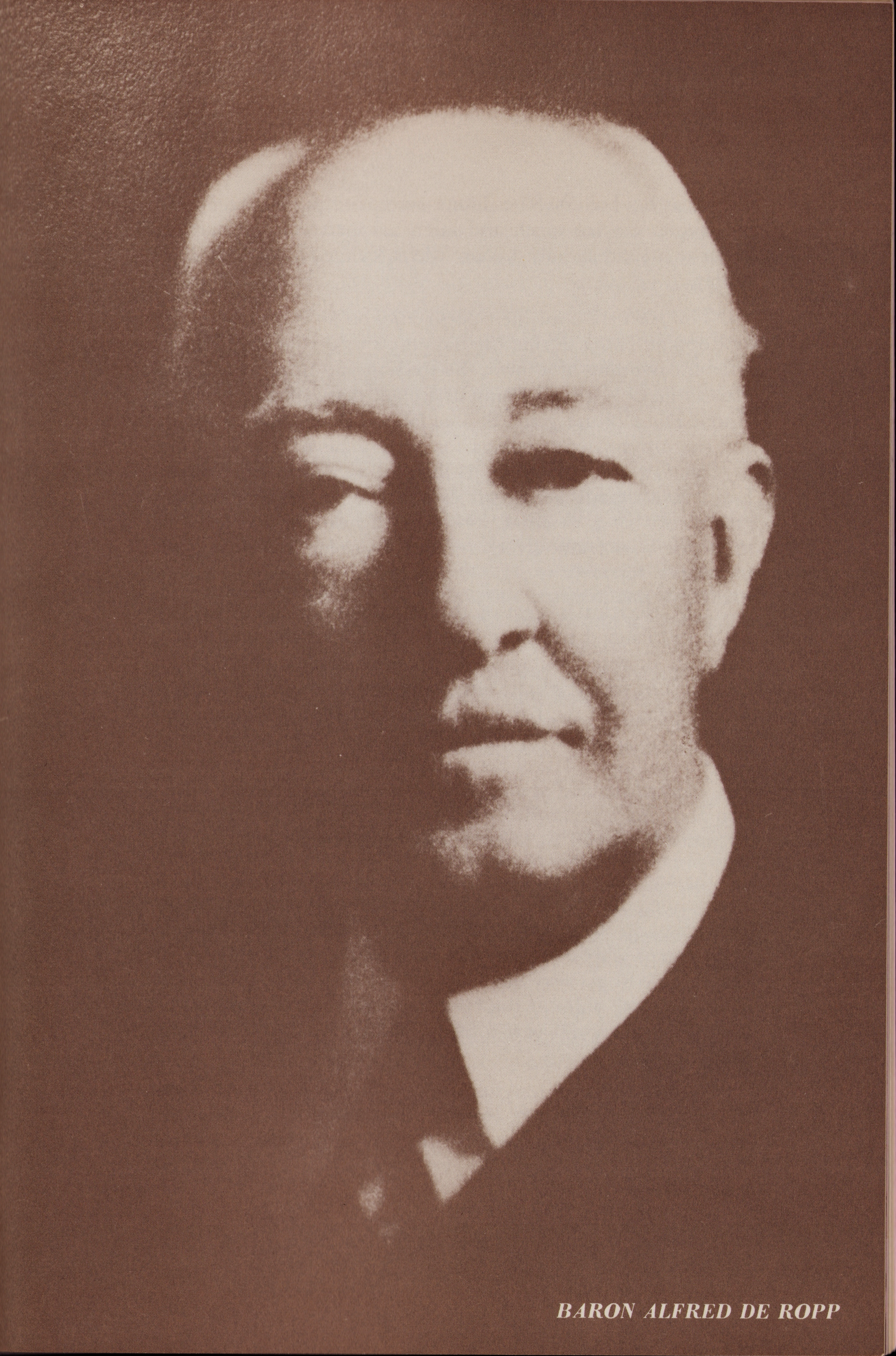
The initial investment needed would be high, however. Grimwood estimated that the first unit plus a second refinery would cost $1 million, providing building costs did not advance.

The Trona directors listened and gasped. Some spoke openly of abandoning the entire enterprise. Grimwood was patient as he went over his plans again in detail, explaining how he had extracted potash in his laboratories and how he had arrived at his cost estimates. President de Ropp, who had made smelters work when they had formerly failed and who had invented a roasting furnace, was convinced. He threw the weight of his experience behind the Grimwood proposals. He would take the responsibility for the decision, and what was more, he would go after the needed capital. The $100 million in Searles Lake brine was too great a prize to ignore even after costly initial failures.

Since 1913 the Searles Lake enterprise had been the American Trona Corp., and it was this company, after Baron de Ropp had obtained the capital, which began construction of the plant that worked late in 1915 and completed it in October, 1916.

The new Trona process was based on pumping raw brine from the lower reaches of the salt bed and it was this novel approach that was to make the enterprise successful.

Fresh water was a problem. Back in the days of the San Bernardino Borax Mining Co. John Searles had solved the problem for his day by taking over Indian Joe's garden and developing its springs to raise fresh vegetables as well as supply



BARON ALFRED DE ROPP

water for his boilers. The Trona enterprise piped water from the former Searles ranch and later, as operations grew, went over the mountains into Indian Wells Valley for an additional supply.

Few men stamped their personality on an enterprise as did de Ropp at Trona during the days of World War I. He supervised the building of a town, the erection of a store—the Trona Mercantile Co.—the planning of a plant that probably he alone visioned as a future giant. Skilled labor was not easy to obtain, and there were two openings for every man, with at least one of them far closer to city lights than the bleak shores of Searles Lake. In a decade before air conditioning sheet asbestos was satisfactory as a shield against desert heat. It was used as sheathing over frame structures and later supplied in shingles for roofs.

The electrical system of the plant and adjacent town had not been planned for more than a fraction of the load it was carrying. Lowered voltages and frequent service interruptions resulted. A young electrician from San Bernardino, Chester Rice, convinced "the baron" that heavier primary wiring was needed. Sure, it would cost more, but it would prevent blowouts and power losses. Today Rice recalls de Ropp as the man who was everywhere and seemed to know most about every operation at Trona, a somewhat explosive genius at times who didn't attempt to conceal his impatience with incompetency.

In addition to managing the Trona properties themselves and turning the former costly experiment into a commercial enterprise, de Ropp had to put in long hours in legal battles with groups who sought to jump the Searles Lake claims. The fact that de Ropp won and sustained his firm's title to the lease of four square miles of the lake from the Federal Government was due in no small part to the support of Judge Charles W. Slack of San Francisco.

Baron de Ropp resigned the presidency of the American Trona Co. early in 1920. He was 62 years old at the time and had spent the greater part of 40 years in mining camps and the last 10 on the desert. A man who enjoyed companionship, a sportsman with a zest for action, and a great lover of flowers, it is not difficult to picture his desire to live with his wife in an urban atmosphere. He made his home in Santa Barbara until shortly after the 1924 earthquake there, when he moved to Coronado where he lived at the Hotel del Coronado for 17 years, a span unbroken except for a two-year stay in the East. He died in Coronado in 1941. Mrs. de Ropp survived him 11 years. During his Coronado residence de Ropp became an American citizen.

The son of the Baltic nobleman had traveled a long path since he had graduated from the Royal Mining Academy in Freiburg, Germany, in 1882, and accepted a $1,000 yearly salary to do gas analyses for the Pueblo Smelting & Refining Co. of Pueblo, Colo. On his voyage to America he was a partner at ship games with J. Pierpont Morgan, and the young Russian nobleman with $150 in his pocket and a $1,000 job ahead teamed up with the American millionaire. After eight months at his initial work de Ropp was placed in charge of desilverizing on the smelter's night shift where he discovered and eliminated the cause for impurities in the lead output, an accomplishment that brought him recognition from the owners.

After a year in Pueblo the young metallurgist was made assistant superintendent of the smelter, an operation of 13 blast furnaces and 30 roasting furnaces. His salary was doubled, and at $2,000 a year he was in charge of 700 men. In 1886 he became superintendent of the entire operation. A year later he moved to the Tomichi Valley smelter, in Colorado, and in 1888 became superintendent of another smelter in the Leadville district. The next year saw him leaving for Butte, Montana, and a connection with the huge Anaconda Copper Mining Co.; he remained there less than a year and took charge of the Shelby Smelting & Lead Co. smelter on San Francisco Bay. The Shelby plant was in trouble financially but under the de Ropp management reduced its debt by $300,000 and began paying dividends. Here was a curious bit of history for de Ropp. He made the Shelby plant pay and thereby brought about its sale to the American Smelting & Refining Co. at a figure regarded as most advantageous to the Shelby owners, in 1905. After two years with the Guggenheims de Ropp took a six months' vacation and sailed for Europe where he put his children in a Swiss school. From London he sent his resignation to American Smelting and shortly afterward was named managing director of Consolidated Gold Fields of South Africa's enterprises in America, the position that brought him to Trona.

Baron de Ropp had three children—two sons and a daughter. The elder son, Alfred de Ropp Jr., was at Trona for several years and has returned from the New York sales offices of the American Potash and Chemical Corp. The younger son, Harold W., has been with the DuPont companies in Wilmington, Del., for a number of years.

Alfred Jr. recalls his father's love of sports, particularly hunting and fishing. "Dad played a good game of bridge, poker and dominos," the son reported. "Family domino games were vociferous and fiercely contested. In his earlier days he was a noted duck hunter and clay pigeon shot. Many a limit of dove was taken by him near Inyokern.

"Dad learned to drive an automobile after his retirement from business, but he was never what I would call a finished driver, and some of his trips from Coronado to Santa Barbara and back were truly hair raising."

The son also recalls his father's joy in flowers and his frequent drives about San Diego particularly to see roses.

The son's description of his father as a marksman is most modest, for de Ropp was one of the nation's crack shots with small arms. During the early days at Shelby de Ropp took some drastic steps to prevent open sabotage. The steps included discharge of what de Ropp described as "50 anarchists" who threatened to blow up the office and plant. When the unruly delegation appeared with its demands, de Ropp had an assistant toss a silver dollar into the air. The first shot from the de Ropp revolver struck the coin. The "50 anarchists" left. The incident was reported by T. A. Rickard in the Engineering & Mining Journal Press. As far as is known, de Ropp never referred to the incident himself.

The man who single-handedly cowed the Shelby "anarchists" had another side few could see. His son recalls, "I would be remiss if I did not bring out his wonderful care of mother whose deafness was one of her greatest trials."

Today on the shore of Searles Lake the multi-million dollar plant of the American Potash & Chemical Corp. is the successor to the American Trona Corp. of World War I days which first produced potash commercially.

The 1962 operations extract not only borax and potash from the chemically rich brine of Searles Lake. The principal products produced include muriate of potash, sulphate of potash, potassium chloride refined, soda ash, salt cake, desiccated sodium sulphate, borax, pyrobar (dehydrated borax), boric acid, bromine and lithium concentrates. From year to year the corporation's chemists have found additional products which could be produced from the amber brine if a commercial market developed.

The present output which amounts to between 40 and 50 carloads daily is a reality because of over 40 years of research and pioneering in the application of physical chemistry to the processing of the complex brine. The brine is an endless storehouse, a seemingly inexhaustible stockpile of chemicals needed in agriculture and industry which nature has stored away during countless thousands of years.

Spiritually, the vast industrial plant of 1962 can trace its roots back to the early lakeside borax operations conducted 80 years and more ago by John and Dennis Searles, who produced borax by evaporating lake brine in huge vats and whose San Bernardino Mining Co. freighted its product by mule team first to San Pedro and later to Mojave after the Southern Pacific Railroad was built.

Historically, Trona is the successor of a pioneer soda development that was a failure and of succeeding less than successful experiments by the California Trona Co., and then of the first commercially successful production of potash by the American Trona Co. American Trona reorganized in 1926, the firm taking the present name of American Potash & Chemical Corp.

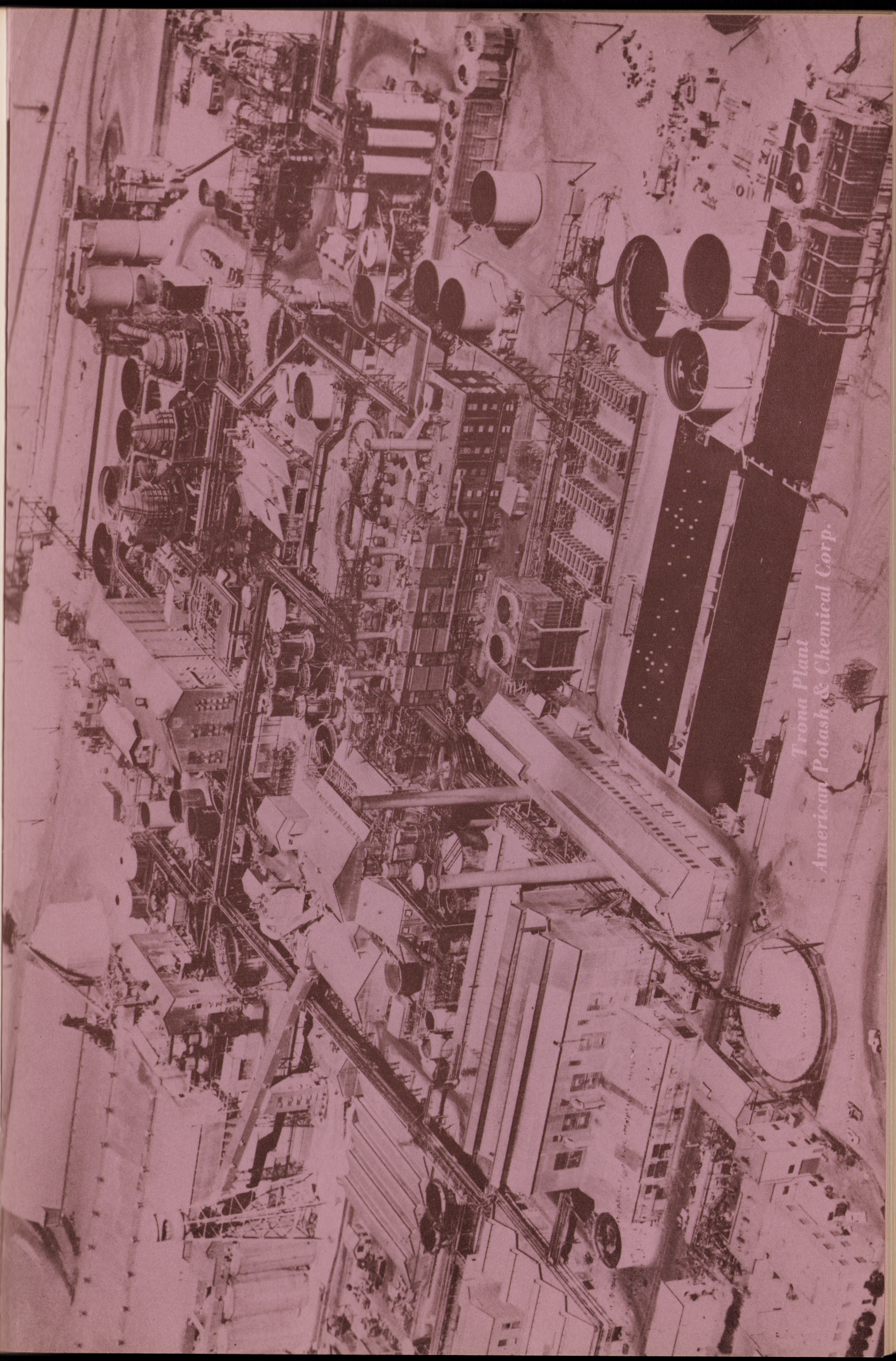
The predecessors of today's American Potash & Chemical Corporation built a whole series of pilot plants before, in 1916, beginning erection of the first permanent mill which gave the United States much needed potash in World War I.

The multi-million dollar chemical output achieved by World War II gave Trona an even greater share in the national defense effort.

The soaring World War I potash prices eventually brought 128 other producers into the field. All of these ceased operations once German potash became again available. Trona was the only domestic potash producer. Since the 1930s potash has been produced from deposits in New Mexico.

Extraction of the many chemicals has been made possible by the development of a unique process. This method, known as the Trona Process, subjects lake brine to evaporators, vacuum crystallizers of various types, carbonization, calcining processes, filter presses, scrubbers, and a bewildering array of heaters and refrigerators. The process utilizes a steam plant with a capacity of one million pounds of steam an hour, an ammonia refrigeration system capable of supplying 5,000 tons of ice daily, an electric power plant with a 30,000 kilowatt capacity, plus a vase array of tanks, condensers, coolers, and driers all connected by miles and miles of pipes.

The brine first comes from two sources, two batteries of wells some four miles out on the lake. One series of wells taps the upper lake and one the lower structure, since the deposit is actually two lakes, from two different eras, stacked one on top of the other. Huge insulated pipes transport the brine to the plant, where it first circulates through coolers in the potash



Trona Plant
American Potash & Chemical Corp.

Program

DEDICATION of
SEARLES LAKE
BORAX DISCOVERY MONUMENT

(REGISTERED STATE HISTORICAL SITE 774)

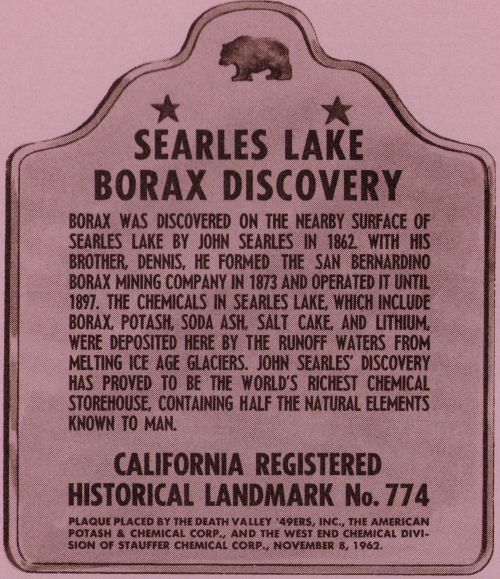
WELCOME .... CHARLES A. SCHOLL
President, Death Valley '49ers

PRESENTATION OF CHAIRMAN .... HENRY HELLMERS
Vice President, West
End Division,
Stauffer Chemical Company

GREETINGS .... ROSS DANA
Supervisor, San Bernardino
County

GREETINGS .... RUSSELL S. SUNDERLIN
Trona Plant Manager,
American Potash & Chemical
Corporation

GREETINGS .... GEORGE C. ELLIS
President, West End Division
Stauffer Chemical Company



SEARLES LAKE
BORAX DISCOVERY

BORAX WAS DISCOVERED ON THE NEARBY SURFACE OF SEARLES LAKE BY JOHN SEARLES IN 1862. WITH HIS BROTHER, DENNIS, HE FORMED THE SAN BERNARDINO BORAX MINING COMPANY IN 1873 AND OPERATED IT UNTIL 1897. THE CHEMICALS IN SEARLES LAKE, WHICH INCLUDE BORAX, POTASH, SODA ASH, SALT CAKE, AND LITHIUM, WERE DEPOSITED HERE BY THE RUNOFF WATERS FROM MELTING ICE AGE GLACIERS. JOHN SEARLES' DISCOVERY HAS PROVED TO BE THE WORLD'S RICHEST CHEMICAL STOREHOUSE, CONTAINING HALF THE NATURAL ELEMENTS KNOWN TO MAN.

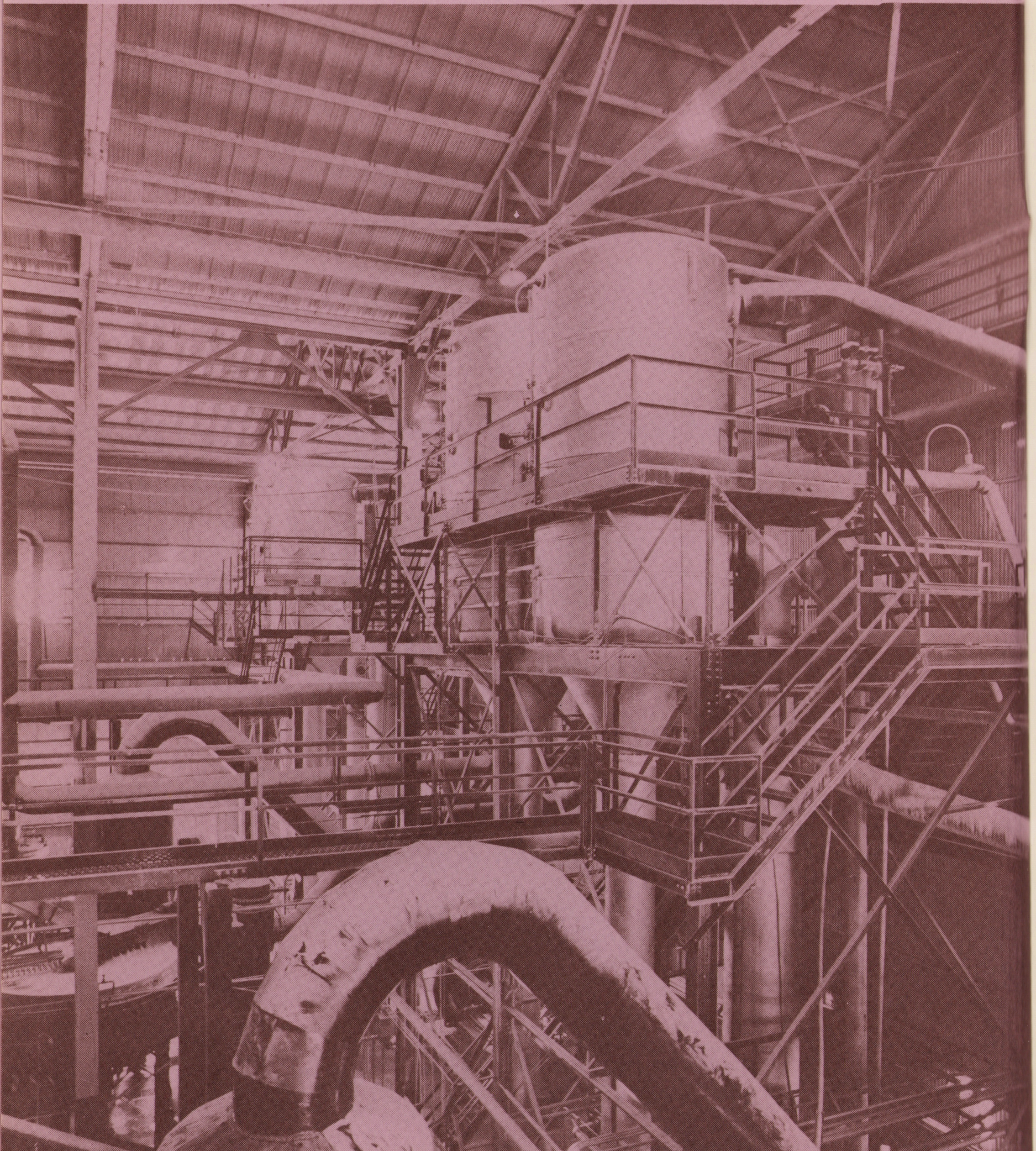
CALIFORNIA REGISTERED
HISTORICAL LANDMARK No. 774

PLAQUE PLACED BY THE DEATH VALLEY '49ERS, INC., THE AMERICAN POTASH & CHEMICAL CORP., AND THE WEST END CHEMICAL DIVISION OF STAUFFER CHEMICAL CORP., NOVEMBER 8, 1962.

GREETINGS .... MRS. W. R. HARRIMAN
Member, California Beaches and Parks
Commission

ADDRESS .... L. BURR BELDEN
Historical Editor,
San Bernardino Sun-Telegram

MONUMENT UNVEILING .... ARDIS MANLY WALKER
Co-Chairman, Dedication
Committee



Modern Chemistry at West End Plant
of Stauffer Chemical Co.

plant. The brine serves as a cooling medium and at the same time absorbs heat preparatory to its own processing. The brine is mixed with end liquids from a previous cycle of the plant operation and goes into giant triple-effect evaporators. As evaporation proceeds, salts separate from the boiling liquid and are collected in settling devices and filters. These include common salt and a double salt of sodium carbonate and sodium sulphate. These go to the soda products plant for recovery of soda ash and salt cake. Crude lithium sodium phosphate is recovered and converted to lithium carbonate. It comes from the double salt, or burkeite as it is known.

After the salts have been drawn off from the liquor, rapid cooling under vacuum causes potash to crystallize. The potash crystals are removed by settling and centrifuging. The larger percentage of potash is then dried in rotary driers and shipped for agricultural use, while the remainder is converted into chemical grade potash and sulphate of potash.

Next, after the potash is removed through its crystallization, the borax-rich liquor goes to the borax refinery where technical borax, refined pentahydrate borax, and dehydrated borax are produced. The dehydrated product is a red-hot molten product subsequently cooled and crushed. There are by-products plants all along the cycle. Lithium carbonate is made early in the cycle. The bromines are produced as an offshoot of the potash crystallization. Carbonation from both boiler house stack gasses and carbon dioxide is used to produce bicarbonate of soda which is dried, calcined, bleached in a rotary kiln, then recrystallized and dried with soda ash the end product.

The story of Trona during the past three decades has been one of constant expansion of plant facilities, refinements of the basic extraction process and discovery of new products. In 1920 the American Trona Co. produced 9,629 tons of potash and 4,463 tons of borax, quite a lusty infant in the industrial world of the day.

With the reorganization of 1926 the company enlarged and completely rebuilt the plant, accomplishing this feat without stopping production. The following year Trona began production of boric acid.

By 1930 the plant could boast an output of 94,000 tons of potash and 53,000 tons of borax or approximately 10 times the production of 10 years earlier. The 1930 output came in the middle of a second major expansion program which was completed in 1934 and which doubled the capacity for production of both potash and borax and started production of dehydrated borax, refined muriate of potash, and recovery of sodium sulphate and sodium carbonate.

By 1940 the husky infant of 1920, the growing boy of 1930, had become man-sized. Production in 1940 amounted to 190,000 tons of potash, 95,000 tons of borax, 52,000 tons of soda ash, and 85,000 tons of salt cake.

The American Potash & Chemical Corp. is one of three major producers of borax today, the borax which was discovered in Death Valley by Aaron Winters and in the lake brine by John Searles.

Trona production has been accomplished by the erection of a modern city in what long was regarded as a remote desert region far from civilization. To accomplish the remarkable expansion of the pioneer dry lake enterprise has required far more than plant expansion and chemical knowledge. It has required the creation of modern living conditions far from other communities. The unpainted frame structures that housed employes of the San Bernardino Borax Mining Co. were lighted by kerosene lamps, yet they were superior to living quarters in the average mining camp. Baron de Ropp introduced electric light and power and a railroad connection with the outside world. He did more for he saw to it that a mercantile establishment was started and the first efforts made toward insulating dwellings against summer desert heat. His successors utilized sheet asbestos composition, brick and concrete to produce structures far more comfortable, but it remained for the 1930s to bring in air conditioning.

The modern community has grown simultaneously with the rapidly expanding plant. Modern apartment houses and an entire village of private homes, a department store, barber, drug store, theater, newspaper, modern hospital and a school which employs some 40 teachers and takes the child from kindergarten through high school. All have become a part of today's Trona. Streets are tree-shaded and paved.

In nearby Valley Wells the company has recreation facilities including a swimming pool. Also a subsidiary company builds homes at nearby Pioneer Point. They are privately owned. Both the Trona and Pioneer Point residential districts will compare favorably with residential districts of valley cities. There are sports activities, clubs, churches and veterans' organizations. The isolation popularly associated with desert living belongs to the past.

The Story of "Borax" Smith

By Ardis Manly Walker

The moon was shining over Teel's Marsh that night in 1872 when Francis Marion Smith worked feverishly staking borax claims across its shimmering, saline expanse. There was good reason for his haste. Just a few days previously he and two choppers from his wood camp nearby had gathered samples of a heavy incrustation here. Preliminary testing had indicated them to be rich in borax. These samples Smith had delivered to an assayer at Columbus, Nevada where borax was being produced.

W. P. Bartlett, who had visited the desert borax regions as agent and appraiser for Stauffer Chemical Company of San Francisco, recalled this incident in later years. He passed on Smith's story of the assayer as Smith had told it to him one night at Marion, one of Smith's borax camps.

In Smith's words, "I gave him my samples, and asked for an assay. He asked me where I got them and I told him.

"After a preliminary flame test, he said it was borax, probably of a very poor quality, and asked me to come around in the morning. It told him to make an assay at once, as I must return that day. He said that it was impossible and for me to come in at 10 o'clock next day. . . .

"For some reason my suspicions were aroused, and doubly so, when I heard him talking earnestly to someone in his back room.

"As I came out, two young men stepped out of the back door, and hurried across the back lot. I decided then and there not to wait for the assay. In ten minutes I was riding for Teel's Marsh as fast as my horse could carry me. Nearly all night I worked by moonlight."

Before ten o'clock next morning, when he might have been in Columbus calling for his assay, he had staked and placed location notices on the areas of Teel's Marsh where the borate deposit was evident. Then, after a brief nap, he rode across the marsh on his way to record his claims.

At the edge of the marsh he encountered the two men he had last seen stepping out of the assayer's back door. They introduced themselves as coming from Columbus where their friend, the assayer, had asked them to locate some borax deposits. They asked Smith if he could direct them to Teel's Marsh. Smith was more than accommodating. He loaned them for a guide one of his wood choppers who led them to an alkali flat more than twenty miles away. By the time they had returned from their wild goose chase, Smith had filed his location notices.

The Bartlett quotation from Smith's account concluded, "If I had waited until ten o'clock that day, I should have lost the whole property, and would probably never have gotten into the borax business.

"As it was I got an abandoned salt pan from a silver mill, and began crystallizing out borax. . ."

This incident was indicative of qualities which were to shape the fabulous life of Francis Marion Smith. Certainly they launched him into a career which was to earn him the title of "Borax King" and gain him distinction as sportsman, philanthropist and builder of empires.

But kings of industrial empires are not made in a day. They must be tempered in the buffeting fires of competitive existence, as Smith was to find out the hard way. He also learned that industrial thrones are never secure so long as there is more than one aspirant for the crown. During his long career he came to know that a lifetime of dreams and endeavor led to each conquest.

"Borax" Smith's first dreams came to him on a farm in Walsworth County in the state of Wisconsin where he was born February 2, 1846 in a log cabin built by his father.

He wrote in his declining days, "I recall my first inspiration to 'go west'. I was at that time fifteen years old."

But the Civil War was to take his older brothers into service and he must remain to help on the family farm.

Meantime, Smith recalled, "There were six children in the family . . . . all of whom received their early education in the district school. . . . . As we grew older we all attended Milton Academy which institution later became a college."

Thus, by the time Smith had become twenty-one and the Civil War had passed like a bad dream of the past, he was adequately equipped to venture west into an empire that he was to pioneer.

As he said, "This was in April, 1867; I then started west in high hopes and bright dreams."

His west-bound train ran into a giant freshet. He left it and walked 50 of the miles into Omaha along the inundated road bed.

From Omaha he traveled 2500 miles by steam boat up the Missouri River to Fort Benton, then 150 rough miles atop a Concord stage to Helena, Montana. Here, after trying his hand at everything from mucking to dish washing, he enlisted to fight Indians who never appeared on the warpath. For the most part, he moved with the restless drift of prospectors who pursued, with ever-recurring hope, ephemeral bonanzas.

By the fall of 1872 he had established himself about ten miles from Columbus, Nevada. There he was under contract to deliver wood to the mills and timbers to the mines. In line with these operations, he purchased a wood ranch and on it erected a crude cabin. His cabin commanded a wide desert view including the distant Columbus Borax Marsh and, at another angle, in the shimmering distance, the image of a vast saline flat known as Teel's Marsh.

Smith became curious about Teel's Marsh. He had observed the borax operation at Columbus Marsh and had concluded that he did not need to come up with a gold mine in order to make a stake; this might be accomplished by means of a good borax prospect. Hence, his taking of samples at Teel's Marsh and his subsequent encounter with the Columbus assayer and the assayer's misguided friends.

FRANCIS M. SMITH

Smith's initial success in protecting his discovery proved only a temporary respite from the hazards that were to become factors in his way of life. But his earlier experiences had prepared him for them. On his long journey west he had overcome many of the hazards of pioneer travel. At the western end of the overland railroad he had built up a large restaurant business in the face of the toughest element he had yet encountered which he labeled "the bunch that followed the immediate construction of the Central Pacific Railroad."

In fact he gave as a reason for selling out in favor of prospecting and, later, wood contracting, "Competition was sharp and the class of customers not to my liking."

Then he encountered a similar element from which he must protect his wood business. In this case he was forced to walk twelve miles to acquire a Spencer rifle and the only four shells that would fit it. Out of reach of the protecting arm of the law, he took a lone stand with these inadequate armaments. His show of the gun and a fiery determination to "stand pat" turned back outnumbering and well armed hoodlums who had invaded his property to dispossess him by force.

So it would seem that it took the kind of a man Smith was to set and hold his roots in sight of Teel's Marsh long enough to make his fateful discovery. Also, it would seem, the tenacious fight he had always put up to "hold his ground" wherever he moved was but rehearsal for things to come. Circumstances had challenged his courage, his vision and his rugged energy. In him these qualities developed as do the skills and the physique of an athlete in training.

Thus, Smith set to work with well conditioned confidence and an inflexible will to file claims on the boundless acres of Teel's Marsh .

The well-directed vision of the man also had been brought to bear on the proposition. Smith had given the Columbus Marsh operation and the contemporary state of the infant borax industry in the West a lot of study. He had learned that borax was selling for thirty cents per pound in carload lots.

This was enough to convince Smith that he should strive to control this valuable commodity.

His first hurdle developed almost immediately. It was a land office ruling that borax was a mineral and not a salt. This reduced the size of borax claims to twenty acres and destroyed the legality of the 160 acre claims with which Smith had covered Teel's Marsh. With haste, with energy and with the exercise of unbroken vigilance, Smith bent to the task of relocating claims covering several thousand acres of salt marsh.

His task was doubly grim in view of the sensation his discovery had caused among prospectors up and down the Pacific Coast. He was engulfed in a feverish influx of prospectors. During this period of contention Smith battled grimly against all intruders who came to dispossess him. He protected his discovery rights by strategy if possible, with physical force if necessary and by litigation as a last, unwelcome resort. He also purchased over one hundred claims to control a deposit amounting to approximately 20,000 tons.

After securing his rights to Teel's Marsh, Smith joined with his brother, Julius, and the Chicago firm of Storey Bros. with the result that the firm of Smith and Storey Brothers was in borax production by the fall of 1872. In building his initial organization, Smith hired John Ryan and Christian Brevoort Zabriskie. They were to rise with him to historic heights in the history of the budding industry.

These men faced the high production costs imposed by their isolated location. Furthermore, they soon found that the production at Little Borax Lake in California and at Columbus Marsh had broken the limited market from 30 cents to 10 cents per pound. While these handicaps dampened the enthusiasm of others who owned claims at Teel's Marsh, they only tempered the determination of Francis Marion Smith to take advantage of low prices and buy up and consolidate all of the claims in the area.

Perhaps the very uncertainties which brought this move about were sufficient to decide Storey Brothers to sell their interest to Smith Brothers after but a few months of operation. And, very likely, these conditions combined with the elimination of a tariff on borax and the placing of a tax on the proceeds from borax and soda mines began to undermine the confidence of others in the future of the borax industry.

By 1875 the group at Little Borax Lake had given up the ghost. In fact, by this time only five of the companies originally interested in the business were still in operation. These included the San Bernardino Borax Mining Company which was producing crude borax at Searles Lake. Perhaps this was because the superintendent of this company was John Searles. This pioneer prospector and grizzly bear hunter had discovered Searles Lake as early as 1862 and had maintained his faith in borax with the same vision and determination that had marked the career of "Borax" Smith.

While those others were disengaging themselves from borax, Smith Brothers secured a firmer grip on the industry. "Borax" Smith had arranged through William Coleman and Company of San Francisco to market his product.

In Coleman, Smith had associated himself with a man of his own mold; an adventuresome spirit of great vision who had taken his place high among those who were using newly-discovered wealth and resources to build the new commonwealth of California. Coleman had established his commission house during early gold-rush days. Since then he had helped to finance some of the young industries of the state and, in 1864, had marketed the first borax produced in the West.

Even with the experienced and capable Coleman as sales agent, Smith was encountering difficulties. Production had outstripped demand and he saw no relief from the price squeeze under existing circumstances. He therefore decided on a campaign to enlarge and broaden his market while acquiring and consolidating an even more massive source of supply.

His initial step took him to New York City. There being no effective Madison Avenue for that period, he rented a store and office at 155 Water Street and launched a one-man campaign to sell Smith Brothers borax to grocery and drug tradesmen. Borax soon became the cure-all and the clean-all for the world under the convincing spell of Francis Marion Smith's enthusiasm.

Meantime he had acquired 16,000 acres at Columbus Marsh and a store at Columbus. This operation he placed in charge of Zabriskie whom he later named as superintendent of the operation when he organized it as the Pacific Salt and Soda Company. This was a step toward enlargement and consolidation.

Then, after buying up his brother's interest in the Teel's Marsh operation, he reorganized it as the Teel's Marsh Borax Company. With this move, he became the largest producer of borax on the Pacific Coast.

Meantime, in Death Valley, Aaron and Rosie Winters had found that samples of the cottonball deposit in that desolate region burned green. Coleman immediately dispatched an agent who purchased the new borax discovery. By the winter of 1882 the Harmony Borax Works was in operation. The problem of the long desert haul to the railroad at Mojave was solved through creation of the famous 20-mule borax wagons and the training of the 20-mule teams. Coleman organized the Harmony and Meridian Borax Mining Companies; the one to operate during winter months in Death Valley and the other to produce from a newly acquired deposit in the Amargosa Valley during the summer.

With the advent of these operations a new form of borax called colemanite was discovered by one of Coleman's prospectors. Since it posed refining problems, this new discovery did not immediately affect operations. However, increased prospecting activities uncovered additional colemanite deposits. Finally Coleman acquired a large deposit of this mineral at the silver camp of Calico.

This was temptingly close to a railroad. So Coleman had a method developed for refining the ore. He also converted an old soap factory at Alameda into a refinery.

Then, just as his dream of big-scale production at Calico was reaching reality, in the spring of 1888 the tragic financial failure of the great commission house of William T. Coleman and Company occurred. In order to maintain and develop his industrial empire, he had borrowed heavily. Unexpectedly, some of the banks called in their loans and Coleman lost everything.

Smith had been closely associated with Coleman and knew that the future of borax lay in the processing of colemanite. Nearly two years after Coleman's failure he acquired the Meridian and Harmony Borax Companies. And within six months he consolidated all of his holdings under a new organization, The Pacific Coast Borax Company.

During the next five years the borax king entered into a maze of industrial developments. A brief recitation of them would include the Calico, the Lila C., the Widow, the Biddy McCarthy and the Grandview mines and the Death Valley and Tonopah and Tidewater railroads.

Having established himself in a fabulously palatial Oakland home, he took steps to materialize his dream of an incomparable development for the East Bay region which fronted his mansion. These steps included the establishment, in association with Frank C. Havens, of the Realty Syndicate and the acquisition of 13,000 acres of valuable land in the Oakland area. In order to develop this property, Smith and his associates bought up and consolidated various street car lines until they controlled the rail transportation of Alameda County under the Key Route System. In the course of events they also acquired the People's Water Company and built the Syndicate Building, the Key Route Inn and acquired an interest in the Claremont Hotel.

Meantime, other phases of Smith's life had developed. As a multi-millionaire he made many magnificent philanthropic contributions. He was a patron of the arts and a sportsman of international repute. Most of all, he devoted his fortune and his energies to the development of the East Bay community wherein he chose to live out his days. To his 40 acre Oakland estate, to which he had brought as tribute art treasures from all over the world, he moved the little wind-racked shack which he had built as a crude shelter near Teel's Marsh so many years ago. With it as a treasured memento of humble beginnings, he enshrined the abandoned salt tub in which he had produced his first borax. "Borax" Smith had traveled a long trail to great heights, but, along the way, he revered increasingly the simple origin of his dream.

But his dream was not finished. To him life had become a continuing challenge to match his dream with material achievements. There were other empires to build. At this point he should have taken warning from the crash of the Coleman empire. His old friend and associate had died, one of California's immortals, after spending his last years repaying every cent of the indebtedness left in the wake of his financial collapse. Or he could have recalled the other giant, William Ralston of San Francisco, who walked quietly and alone into the waters of the Pacific, leaving behind the wreckage of another empire. But Ralston and Coleman were such men as never cringed at fate. Such a man, too, was "Borax" Smith.

Flexing his muscles for larger fields, he envisioned Oakland's water front as a gigantic system of docks and wharves designed to accommodate the largest liners and freighters to plough the world's oceans. Fifty years ahead of his time, he laid plans that anticipated the Bay Bridge.

With such projects in mind, he dissolved his partnership with Havens, retaining the Key Route System and traction interests. Then, in association with W. S. Tevis and H. G. Hanford, he organized the United Properties Company which was incorporated for $200,000,000 and into which he put all of his holdings. Then, after his organization had contracted obligations totaling $11,000,000 subject to 24 hours call, the sky fell in on his dream. Out of that clear sky came an order from the state bank examiner demanding immediate liquidation. This was impossible on one day's notice. Smith rebelled impotently as his financial structure, in spite of sound assets, crumbled.

Thus fate snatched away the tools of his career. But fate could not kill his dream, even at his age of 67.

Unlike Ralston and Coleman under similar circumstances, Smith was not to suffer an end to his empire building. One of the few of his many interests which did not become involved in the crash was the West End Consolidated Mining Company, a silver mine at Tonopah, Nevada. With this operation as a spring board, he marshalled his energies and talents for a comeback.

Certainly the Borax King could envision no such comeback without borax playing the major role. He remembered inspecting a borax operation carried on by John Searles at Searles Lake in the old days when Coleman was still active. He acquired claims in the area and formed a subsidiary to his mining company which he called the West End Chemical Company. It was to operate a chemical plant for the purpose of extracting borax and other chemicals from the brine of Searles Lake.

Plagued with technical difficulties at his Searles Lake plant, he hired a young chemist, Henry Helmers, to work on his problem. Meantime, he learned that two prospectors, George Hartman and Francis Marion Lovell, had located an immense deposit of colemanite in the Muddy Mountain Range near Fort Colville, Nevada. He learned, also, that his competitors had been informed of the find. His was a race against time. Although nearing the age of 75, he is reported to have chartered a plane of 1921 vintage and made a sagebrush landing as near as possible to the discovery; then to have ridden the last 80 miles on horse-back. In this atmosphere of a western movie thriller Smith bought the property for a quarter of a million dollars, signing the contract on the back of an old envelope.

It has been reported, "The papers were signed on a flat rock in the burning sunshine and the deal closed—while agents for competing interests waited vainly at a little distance." The Borax King now controlled one of the largest bodies of colemanite ever discovered.

The deal had been closed on his anniversary; so Smith called his newly acquired property the Anniversary Mine. This deposit gave him a source of borax not affected by such technical difficulties as had been experienced at Searles Lake. Hence, his base of operations was moved to the Anniversary Mine.

Then followed the discovery of a new type of borax ore in the vicinity of the Calico Mountains. It was known as kernite and was available in such quantity and quality as to drive colemanite off the market.

By now, however, Helmers had solved the major problems of production at Searles Lake. Smith then moved his base of operations back to that area where he saw the West End Chemical Company develop into the third largest borax producer in the world.

In October of 1927 a paralyzing stroke accomplished what adverse circumstance and financial maneuvering had never accomplished. It halted his magnificent career. But not before he had witnessed the launching of his newest empire.

For better than four years he remained an invalid, unable to take an active interest in business and civic affairs. However, his life continued into times when engineers began talking of a San Francisco-Oakland Bay Bridge. It was as though his dream of the distant past had become manifest as an emerging reality. And he was happy at the thought.

Other emerging realities were taking shape along the saline shores of Searles Lake. Three modern communities—Trona, Argus and West End—were rising above the strata of mirage in which John Searles toiled to materialize his own dream of the early 1860's. Housed within sprawling industrial buildings that line the lake shore are other monuments to the dreams of chemists and physicists who have toiled in the wake of the Borax King and the Bear Hunter. These are the maze of pipes, powerlines, tanks, vats and mechanisms from which radiate a web of truck lines, rails and airways, telephone and telegraph and radio communications by which borax and many associated products are produced, promoted and delivered, even to the uttermost fields of space exploration.

Verily, in more ways then one, the present is a far cry from those days, one hundred years ago, when John Searles crystallized borax from lake brines by the primitive means at hand. Likewise, a new and significant phase of western history points in perspective to an origin at the door of a rustic cabin overlooking Teel's Marsh. Through that door "Borax" Smith stepped into a new era as he started crude production in an abandoned tub. He also projected one lifetime of concentrated dreams and enterprise into two fabulous empires. For human benefactions and the sinews of an aerospace civilization, posterity is forever indebted to those dreams and that enterprise.

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